VOLUME 1 - NO. 8 NOVEMBER 1993

The Low Band Monitor

In This Issue

We will use this issue to catch up on correspondence from readers and take a look at the CQWWDX Phone activity.

Yes, you are going to see over three additional pages of contest spots. This may seem extreme, but it really does give us an idea what conditions were like in this one.

Note that on the contest spots we have also listed the DX station's listening frequencies. Look closely at the frequency splits on the 40 and 80 meter bands. This will give you an idea of the activity experienced during this event.

I don't think that anyone has documented this type of information before. I hope that you find it interesting.

The article by Gary Breed, K9AY on shunt-fed antennas should be of interest to anyone who wants an effective 80 or 160 meter antenna and has limited real estate.

Gary has been able to do some impressive things with vertical antennas in the past and provides us with some keen insights about the shunt-fed design.

A 24-Hour 160 Meter WAC

Received a nice note from Ron Stone, GW3YDX, who reports that he completed a 160 WAC (Worked All Continents) within a 24 hour period on October 23, 1993.

He started the feat with ZL2JR at 0640Z, then TI4CF at 0646Z, WA3CUL at 0700Z, RA9FBT at 1854Z, GU2FRO at 1850Z and finally VQ9QM at 2130Z.

Congratulations Ron! You are proving that Top Band conditions are getting better each day.

A Stateside 160 Meter WAC

Charles Summers, KY0A just reported a 160 meter WAC between October 27 and November 17, 1993 from the state of Colorado.

This adventure started with VK6ACY, VE3BW, HK0HEU, JW5NM, 6W6JX and was completed with JA1CGM.

Notice that the JW5 contact is KY0A's European contact. Continental stations have been marginal copy so far and our morning JA activity just started during the middle of November.

Please send us your 160 meter WAC's! They give us all a true barometer of Top Band conditions.

1992 CQWWDX 160 Meter Results

Received a note from N6DX concerning the 160 meter SSB results from our last issue. Apparently CQ printed N6DX's SSB score as a CW score and thus his fine 5 K showing on 160 Meter SSB was lost for top 25 consideration. N6DX should be listed as 20th in the world on 160 meter SSB. A fine effort from the state of California!

CQWWDXCW 1993

We are starting to hear some of the top stations warm up for this one. Jim Neiger's signal from ZD8Z sure sounds good on the low bands. I wonder why ZD9SXW's signal couldn't have been a little bit more like Jim's on 160 meters?

The *American Airlines* flight attendants strike could present some problems for a number of the operations, as this carrier services much of the Contest DXpedition market. Let's hope that they all make it to their destinations, as we all need the multipliers.

FK8CP just wrote to advise that he will answer stateside CQ's of those stations who call on their own frequency during the CQWWDX CW Contest around 0830Z and 1230Z. He will not answer those stations that call him on 1.838 mz. or his usual listening frequency of 1.843 mz.

Singapore Report

Gus, 9V1ZE advises that he has been on 160 and 80 meters since October from 1100Z to 1430Z, and sometimes 2230Z to 2300Z. He has only worked a few stateside stations this season but did have a huge opening to Europe on November 5, where he worked twenty-five Europeans on 1.831 mz. from 2130Z till 2300Z, with S6 to S8 signals.

He occasionally gets on the 40 meter band but is plagued by Indonesian SSB activity.

Yes, You Beat the Editor!

The CQWW Phone Contest was an opportunity for me to try my new 160 meter Delta Loop and five of my Beverage antennas.

I am not new to these events and knew that the SSB portion of this event is a real character builder for just about everyone in North America, except for WB9Z, who apparently rents WLS, Chicago for the weekend.

The night before the contest I worked PJ1B, V47KP and a VP5 to check out the system and found things to be fine.

Friday night, after making a few QSO's I spent three hours of the contest diagnosing an open connection at the feed point of my Delta Loop. The *Van Gordon* people won't be getting a Christmas card from me this year!

My little antenna maintenance project cost me contacts with 8R1K and TO4MM.

After solving the problem in moonlight, in a 20 mile wind and four inches of snow, I was able to get back into the game at around 0600Z.

Conditions in Colorado weren't much, as no Europeans or Asian stations were heard on either night.

The contest did have a few surprises on 160 meters with V7X coming through nicely for a few minutes and HC0E and HK0HEU were also surprisingly easy to work.

Remi, FK8CP was entertaining, as he refused to work just about everyone who called him.

The second night was by far superior to the first, and I guess I did have a good time.

I had 48 QSO's, 10 Zones, and 23 countries, for a score in the 3 K range. Looks like CT™ won't be needed this year.

I am looking forward to the CW portion of this event, if I can get some cooperation from KOA.

Lance Johnson - Editor

Shunt Feed Secrets

by Gary Breed - K9AY

Editor's Note: Gary Breed, K9AY, was first licensed as WN9AYP in 1961 at the age of 12, and chose his current callsign in 1976. His interest in radio led him to a career that has included radio and television chief enginerr positions and several years as an engineering consultant for broadcast and other communications systems. Since 1985, he has been the editor of ***RF Design*** *magazine, a technical trade publication read by 40,000 engineers worldwide.*

His amateur pursuits include equipment design and construction, antenna development, portable operating, DX and some serious contesting, single-band, all-band and multi-op.

Properly done, a shunt-fed tower can be a highly competitive antenna for 160 or 80 meters. Unfortunately, over the years, good information on shunt feeding has been drowned in a sea of incomplete or incorrect data. The purpose of this article is to present a method that is theoretically sound and has been proven to work. This isn't the only way to successfully shunt feed a tower; it's just one good way to get the job done.

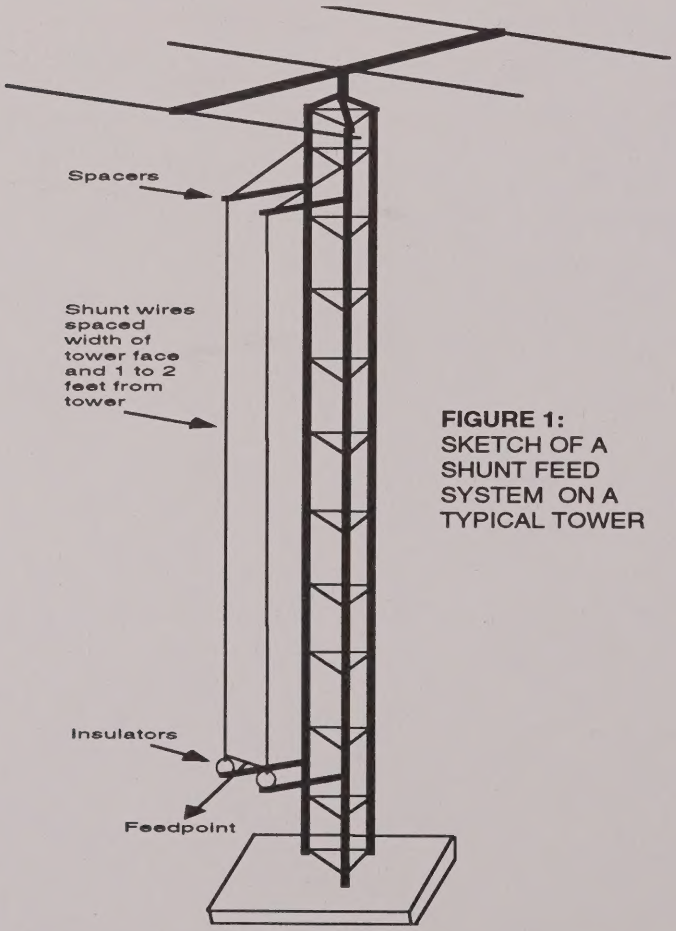

Spacers
Shunt wires spaced width of tower face and 1 to 2 feet from tower
Insulators
Feedpoint

FIGURE 1: SKETCH OF A SHUNT FEED SYSTEM ON A TYPICAL TOWER

- **Step 1** — Insulate the guy wires properly (Skip this step if you have a self-supporting tower). Phillystran is the best way to go, otherwise use non-resonant lengths between insulators. I use 13 feet between insulators for the first section from the tower, then 25-foot lengths after that.

- **Step 2** — Double-check your tower's grounding for static discharge. You're already working on the tower so take some time to check out this important matter. Also, you might be using the same bonding points for your radials.

- **Step 3** — Route all coax and control cables either inside the tower or taped tightly to a leg to minimize differential RF currents. Bring them down the tower until they are below the bottom of the shunt feed system. If these cables exit the tower structure above that point, they will bring RF into your shack and could alter the performance of your new low band antenna. Ideally, a connection should be made at the bottom, bonding the shields to the tower leg.

- **Step 4** — Install your ground system. This work can be done when the weather keeps you off the tower, or when the solar flux is above 150 and everyone is on the high bands. You will either bury a lot of copper in the ground or install a radial system elevated above the ground. This is an essential part of your antenna; give it as much attention as the stuff you have up in the air!

- **Step 5** — Take all hardware off the face of your tower where the shunt feed will be attached. For example, the side mount for your 2-meter Ringo may need to be moved to another leg to leave a "clean" face for the shunt wires.

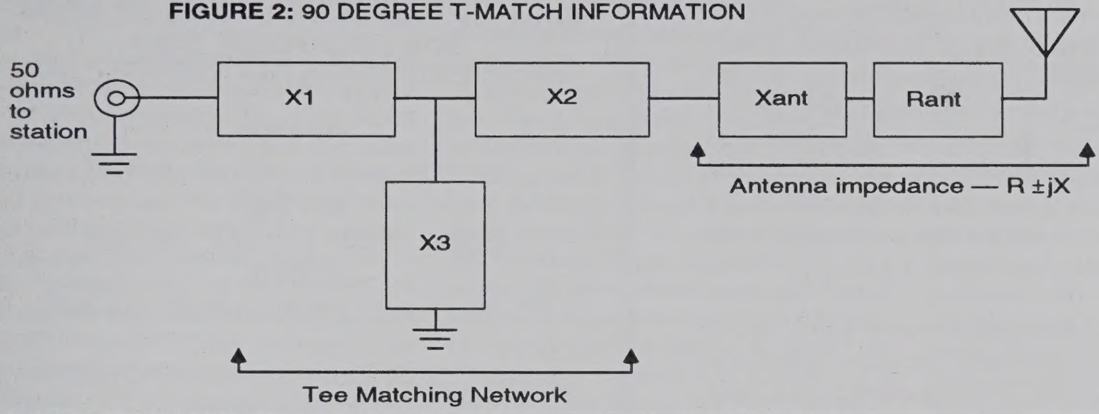
"Hey, I thought this was an article on shunt feeding a tower, not antenna maintenance." OK, all this prep work sounds pretty boring, but you better do it if you want the antenna to work well! On to the big stuff:

- **Step 6** — Install the shunt wires. We want the tower/shunt feed combination to look like a folded monopole with equal size conductors. Without going into a long explanation, a folded monopole has higher radiation resistance than a simple vertical, which makes the ground resistance a much smaller part of the feed impedance. Even with a very good ground, this can noticeably improve efficiency. A single shunt wire is not a folded monopole — the main and shunt conductors must have equal cross-sections to get the necessary equal currents.

The monopole configuration is accomplished by using two shunt wires (#14 or #12 AWG) spaced the width of the tower face. These wires sketch the outline of a conductor that has the same cross-section as your tower. Distance from the tower to the shunt wires should be one to two feet (not critical). The attachment point should be as high on the tower as possible, especially for 160 meter operation. (See the side note "Too Tall on 80 Meters?")

Where the wires attach, brighten the galvanizing of the tower leg with fine sandpaper, clean the copper, apply some anti-oxidant, wrap a few turns of wire around the leg and hold it all down with a stainless steel hose clamp. Good quality electrical tape or a coating of RTV will help protect against weathering (check these joints every year). Spacers made from 3/4-inch PVC

FIGURE 2: 90 DEGREE T-MATCH INFORMATION



$$X1 = \sqrt{50 \cdot Rant}$$

$$X2 = X1 - Xant$$

$$X3 = -X1$$

$$X_L = 2\pi F L$$

$$L = \frac{X_L}{2\pi F}$$

$$X_C = -\frac{1}{2\pi F C}$$

$$C = \frac{1}{2\pi F X_C}$$

or ABS pipe will hold the wires at the proper distance from the tower; put an extra set halfway down to keep things aligned. At the bottom, attach insulators and small turnbuckles to adjust tension. Another set of spacers or a bracket is needed to hold the wires at the right distance. The two wires are tied together and routed to the tuning unit.

• **Step 7** — Match the system to 50 ohms. Besides the folded monopole concept, proper matching is the other secret to a great shunt fed tower. Remember, the shunt feed system is not part of the matching network, it is part of the antenna; forget about moving the attachment point or changing the distance from the tower. We want to match our 50 ohm coax to whatever impedance appears between the bottom of the shunt wires and the ground system — but how do we know what that impedance is?

Measure it! Use a noise bridge with calibration that you trust, or better yet, borrow a commercial impedance bridge like the General Radio 916A or 1606A/B. Make an impedance measurement every 25 kHz across the band, plus some overlap. For example, your 160 meter sweep might cover 1775 to 1925. You will most likely find a steady change in resistance and reactance (almost guaranteed to be inductive) across the band. Really wild impedance changes require further investigation that is beyond the scope of this article. Various systems I have measured range from 20 ohms to 100 ohms resistive, with 100 to 200 ohms inductive reactance. Impedances in this range are readily matched to 50 ohms with good bandwidth.

Choosing the best impedance matching network requires a whole book to explain, but two options will cover most installations. The first is a single component. If the resistive part of the impedance you measured is between 40 and 60 ohms, a series capacitor is all you need for a good match. My own tower has an impedance of 45 ohms and about 180 ohms inductive reactance on the CW end of 80 meters. By measuring the impedance, I knew right away that only a capacitor would be needed. And I could use nice, cheap fixed capacitors because I knew exactly what reactance value to use. 80 meter phone requires a smaller capacitor, so I just switch one capacitor in and out for 3500 or 3800.

A T-network is best choice for broadband matching of the range of impedances you are likely to find. Unfortunately, the T-network is not covered very well in the amateur literature, despite the fact that it is by far the most common matching network for AM broadcast antennas. The broadest bandwidth T-network is designed for 90-degree phase shift, which also has component values that are very easy to calculate. Figure 2 shows this network, and shows how to obtain the values for each of the three arms. When you design your matching network, figure out the values for both the highpass and lowpass types. One of the two will have a smaller percentage change in component values from one end of the band to the other. This is the one to build.

For systems where the resistance and reactance do not change rapidly across the band, the L-network will usually work well. L-network matching is covered quite well in the usual handbooks, and since it isn't as versatile as the T-network, it's not described here.

• **Step 8** — Work some great DX!

Matching Example

Let's say you have measured your system and found the following impedance at your primary operating frequency:

1.830 MHz: Rant = 28 ohms, Xant = +155 ohms (inductive)

From the equations in Figure 2, we get the following possible matching networks. Note that there are two solutions for each impedance, since the T-network can be lowpass (X1 is an inductor) or highpass (X1 is a capacitor):

Lowpass Network —
X1 = 37.4 ohms (3.25 µH inductor)
X2 = 37.4 – 155 = – 117.6 ohms (740 pF capacitor)
X3 = –37.4 ohms (2325 pF capacitor)

Highpass Network —
X1 = –37.4 ohms (2325 pF capacitor)
X2 = –37.4 – 155 = – 192.4 ohms (452 pF capacitor)
X3 = – (– 37.4) = 37.4 ohms (3.25 µH inductor)

Both networks have realistic component values, and if the change in impedance is not drastic across the band, either will work. For optimum bandwidth, calculate the component values for the impedance measured at the band edges, and choose the network with the smallest change from one end to the other.

Case Histories

1. - W0UO is the first station where I applied these principles. Jim is on a city lot with a 70-foot crankup, TH-6 and a 2-element KLM for 40. With shunt wires run all the way to the top, and with a buried radial system of 30-40 wires out to his lot lines, the 160-meter feedpoint impedance was 100 ohms resistive and 100 ohms inductive. These are very nice numbers to work with! A T-network match resulted in low SWR from below 1.8 to over 1.9 MHz. Jim has worked JA using QRP (5 watts) with this antenna, quite a feat on 160! (Now, if he could only hear better...)

2. - At K8NN a 70-foot self-supporting tower with 15 and 10 meter Yagis was matched for 160 meters. The ground system was four quarter-wave radials run four to six feet above ground. After installing the shunt wires, the feedpoint was found to be 25 ohms resistive, 200 ohms inductive. A T-network allowed operation under 1.75:1 VSWR from 1810-1875 kHz. The performance was far better than John's previous antenna, an inverted vee hung from a 90-foot tower.

The consistency of this method was verified by comparing my own tower to K0EU's on 160 meters. Each of us has 66 feet of Rohn 25G with multiple antennas on top, three monobanders on Randy's and a tribander and 2-element 40 on mine. Each of us used identical shunt feed wires and similar elevated radial systems. Both measured about 150 ohms inductive reactance and 30-40 ohms resistance. The greater top loading at K0EU resulted in a higher resistance and a flatter reactance across the band than at my station. Both provided low VSWR across the entire active portion of 160 with simple L-network matching.

I want to emphasize that there is no magic to making antennas perform, but there are two secrets — take no shortcuts, and have the right information on how to do it. Unfortunately, there are too many would-be antenna experts whose only knowledge is "it seems to work OK for me." The best information is the kind you have to work at — like studying *The ARRL Antenna Book* and *Low-Band DXing*, then moving on to serious antenna textbooks. If you want to get the most out of your antenna system, spend the time learning how things really work.

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Too Tall on 80 Meters?

On 160 meters, the height of your tower is nothing to be concerned about; it is almost always going to be less than a quarter wave tall, and virtually guaranteed not to be close to a half wave. But on 80 meters the story is different. You can easily have a modest tower that is too tall to easily shunt feed for 80.

To estimate the effective height, add the following distances together: 1) the height of the tower to the top plate; 2) half the boom length of the biggest antenna; 3) half the length of the longest element on the same antenna; and 4) half the mast height above the top plate. Add a little more if all the antennas are large. This approximation works for typical crankup or guyed towers with a mast the holds two or three beams above the top plate.

If this effective height is within 25 percent of a half wavelength on 80 meters (110-160 feet), you may not be successful shunt feeding the entire tower on that band. Your antenna is close to being a grounded half-wave vertical, which is anti-resonant!

Fortunately, there is a good alternative — make it into an elevated ground plane. Tie three to six quarter wave radials to the tower at a point approximately a quarter wave down from the top, then shunt feed the portion above that. Match and feed it where the radials attach to the tower. The elevated ground plane is a very effective antenna. Try it!

K9AY

LETTERS - LETTERS - LETTERS - LETTERS - LETTERS

Lance:

I didn't know that you wanted all the information on the parentage of the off center fed delta loop (17.5 Percent Solution). The loop is fed 1/4 wave length down from the top point. This makes it essentially a fat vertical with the bottom wire as sort of a ground plane. The classical one wavelength Delta loop is of course .333 on each side. The first place that I saw this antenna was in *Radio Communications* and then in ON4UN's book, the *Secrets of Low Band DXing*, pages 2-47 and 2-102. Mayhead, G3AQC investigated low loops in *Radio Communications* in May of 1974 and Hawker, G3VA looked at vertically polarized loops in *Radio Communications* in June 1973. Feeding this antenna 1/4 wavelength down from the top point will maximize the vertically polarized radiation, which has low angle components and minimal horizontal polarization which is inherently high angle at these very low heights.

John, W0UN

John:

Thank you for the references. This article generated some additional feedback from some other enthusiasts. The 17.5 percent reference is based on the ease in measuring from a corner at ground level to the feed point, as opposed to taking a measurement from the apex to the feed point, that would require you to climb the tower - again.

Lance:

About the Delta Loop and the 17.5 percent feed. I think the 17.5 percent number is predicated upon an assumption that the loop will be .4 wavelength long on the base line and therefore .3 wavelength long on each of the oblique wires. The requirement is that the length from the feed point to the apex should be 1/4 wavelength. This puts the current reversal point at the apex, making the currents in the oblique wires symmetrical. In "Top Loaded Delta Loop Antenna", by Frank Witt, W1DTV, *Ham Radio*, December, 1978, Frank writes; "True vertical polarization (in a direction perpendicular to the plane of the loop ie. the direction of maximum gain) is obtained when the feed point is one quarter wavelength away from the peak of the triangle. You can see that the polarization is vertical by noting the current flow; the vertical components from the currents in the upper sides of the triangle add, while the horizontal components cancel." (He goes on to argue that top loading "lifts" the currents higher and makes the sides more vertical, thus improving the low angle gain.) In the fifth addition of *Ham Radio Techniques*, page 265, Pat Hawker calls it "the method used by L.V. Mayhead, G3AQC" (this particular version is inverted and the feed is 20 percent from the end, but the concept is the same.) In his classic article of 1974 "Loop Aerials Close to Ground", in May 1974 *Radio Communications,* G3AQC does not mention the advantage of correctly positioning the feed, but somewhere I have seen a more recent article in which he does. Mayhead is probably the "very clever gentleman" you seek, though I don't know whether he should be credited with the "prior discovery". The conventional wisdom is that the base wire of a Delta Loop should be no longer than .4 wavelength, which happens to be 220 feet or so. I have used a full wave length Delta Loop fed this way for a number of years on 160 meters and found that the top loading did not make much of a difference. My base wire is about 220 feet and about 8 feet above ground. The apex is at 115 feet and is pulled out from the tree by a horizontal line. I think that a standoff is useful. On my system, I can move the resonant frequency about 25 khz. by raising the center of the base wire a few feet.

Bob, VE7BS

Bob:

Outstanding! The article by Frank Witt, W1DTV probably comes the closest to explaining the theory used by the "17.5 Percent Solution" Delta Loop. The L.V. Mayhead, G3AQC article, however, should probably be read first. You say top loading did not make much of a difference for you - interesting? I am a believer!

Lance:

I read the Delta Loop and Battle Creek Special articles with great interest. I sure hope more DXpeditions take advantage of the free use offer by the Battle Creek Special developers, W8UVZ, K8GG and W0CD. The GAP-IV seems to suffer either from poor instructions or poor performance on the low bands. This was readily apparent on the VK9MM DXpedition where they used a GAP-IV for 160 and 80 meters. They were inaudible on 160 meters east of California (or at least east of the Mississippi). On 80 meters they were 20 db below the level of inland VK's using low dipoles over average earth, yet they were on a low reef surrounded by salt water! Years ago, another group using a simple vertical was noticeably louder than most VK's from the same location. The side fed Delta Loop is indeed an effective antenna for the low bands. The targeting of 17.5 percent up from the lower corner obscures the reason behind the side feed. If you calculate the length from the feed point to the apex, you will notice that it is 1/4 wavelength. The feed point is a current node and the voltage nodes are located 1/4 wavelength away, placing them at the apex and the middle of the bottom wire. Another current node exists in the opposite side, also 1/4 wavelength down from the top. It can then be readily seen that the side fed Delta Loop can be modeled as two sloping half waves (or sloping dipoles) with their bottom ends folded back in towards the center. It will further be noticed that because of the symmetry the horizontal components of the currents flow in opposite directions and cancel. The vertical components of the currents flow in the same direction and add, acting as two verticals in phase with a spacing of approximately one wavelength, producing an elliptical pattern with a gain of 1 db broadside to the loop with a 2 db front/side ratio. The October 1993 issue of QST carries an article entitled "The Earth Tunes My Antenna". which describes impedance and resonance effects of the earth on a half wave dipole at various heights above ground. I have noticed a similar effect with the vertically polarized Delta Loop. The familiar formula for a full wavelength loop is L= 1005/F (mhz.). For 80 meters (3.5 Mhz.), this comes to 287 feet yet I found resonance to be below the band and had to reduce the number by 10 feet to 277 feet total or approximately 92 feet on a side for an equilateral triangle. Another interesting observation is that the vertical height of an equilateral triangular loop is just over 80 feet for 80 meters, 40 feet for 40 meters, etc. The feed impedance of a full wave loop should be approximately 100 ohms. This is easily matched by using a 1/4 wavelength 75 ohm cable followed by any length of 50 ohm cable, or simply use any odd number of quarter wavelengths of 75 ohm cable. On the low bands, RG-59 will handle the legal power limit with no problem. I have been recommending just such an antenna to friends for years as an effective 80 meter DX antenna which doesn't require much space or radials. KZ4V, WZ4F and WA4CTA all will attest to it's effectiveness! Each has one installed at approximately 90 feet using RG-59 for part or all of the feed line. KZ4V and WA4CTA both worked ZD9SXW with ease his first night on 80 meters using their vertically polarized Delta Loop antennas.

Tom, N4KG

Tom:

Your comments about the VK9MM Mellish Reef operation are interesting. The 1980's VK9ZM operation was indeed a "slam dunk" on 80 meters (I even worked them!). A 75 or 80 meter contact with VK9MM was definitely not trivial this time! Most of us thought that a new 160 meter country was in our future, but I am embarrassed to say that most Colorado stations never heard them on 160 meters. Propagation on this band can sometimes make a good antenna look bad. VK4CRR is one of our subscribers, and advised by telephone that he would provide some insight about their operation at a later date. The insights you have provided about the "17.5 Percent Solution" Delta Loop were excellent. Your input, combined with the other writer's comments, should give the person who wants to try this antenna a very sound theoretical and practical operating theory. Bob, VE7BS feeds his Delta Loop with 75 ohm coax, with no 50 ohm coax in the line at all. The additional 1/4 wavelength of 75 ohm coax is a good idea. In Zero District we use RG-59 for two applications 1.) Tying rose bushes to wooden stakes and 2.) Holding down the tailgate of your pick-up truck.

Lance:

I was using a corner fed Delta Loop on 80 meters and after reading the "17.5 Percent Solution" thought I would try moving the feed point up as you described. I am now hearing Europe before sunset on the antenna and just want to say that you are not blowing smoke with this idea.

Phil, K8UNV

Phil:

Thanks for the input. I am pleased with the results of mine but will continue to work with it during the winter. As you can see from the previous letters this antenna does have potential. Maybe a better title would have been, "A Quarter Wave Down From the Apex Solution".

Lance:

You seem to have received a lot of comments about the "17.5 Percent Solution" Delta Loop used at KY0A. I want you to know that I figured out the feed without knowledge of any of the previously mentioned articles and am still using the antenna on 160 meters for transmit. It is great to see that others have applied this concept before and have had some success. Please tell your readers that I use twenty-six, 1/4 wave length radials centered below the antennas apex, not the twelve that you mentioned in the article. The radials seem to improve the antennas performance off the ends, lower the noise level on receive and change the loading.

Charlie, KY0A

Charlie:

For simplicity and cost, this antenna has as much "bang for the buck" as anything I have tried on 160 meters and when down sized, provide others with a solid 75 or 80 meter system. We thank you for sharing this concept with us. I am going to experiment with some elevated radials below mine later this year, but am quite pleased with the initial results so far. Twenty-six 1/4 wave length radials!

Lance:

Glad that I ordered the back issues of the *Low Band Monitor*. It certainly fills a big void in ham radio publications. The Battle Creek Special article was of particular interest. I have a few suggestions: 1. Show the mode on 160 meter spots. 2. Number the pages. 3. When showing Beverage layouts, orient North at the top of the page. I would also like to see HF DX Cluster spotting net frequencies and LF Broadcast stations used as propagation beacons. I bought the Timewave DSP-9 based on the product review and am delighted with it's performance.

Pres, N6SS

Pres:

I am still evaluating the overall spotting format. I may have two sets this issue so that contest activity can be differentiated from normal DX activity. Page numbering really hurts 11th hour flexibility. If the Peter I group sends me camera ready "special low band operating schedules" one day before printing I would have to renumber the pages. I'm lucky if I'm able to spell check every page now! No problem on the Beverage orientation, that would be more logical.

Lance:

Top Band has been quite good of late (18 Oct 93). Last Thursday I managed to work four ZL's in one morning, which is the most I have ever done in an operating session. Unfortunately there was no sign of FK8CP on 1.838. I need him and guess I shall have to QRX the peak grey line on November 1st. Fortunately I managed to snag ZD9SXW on 160-80-40 before his LF antenna problem struck. That was a good one and of course it helps if there is a super operator at the far end. Last Thursday I had a go at the 160 meter WAC and in a single 24 hour period managed all continents except South America! I still haven't found a South American on the band since! The noise level on the band remains high as I write. Another snag on 160 meters is the SSB DX net on 1.844. Some of the signals are so vile that they destroy weak CW on 1.835 They have been told about it but the response is usually abuse. I guess that you have the same kind of idiots in the USA. At this point I have worked over 1100 different USA stations on 160 meters but if anyone still needs GW, I am always available for schedules. My best time is usually 30 minutes before our sun-up. I am also usually logged in to the DX Packet Cluster.

Ron, GW3YDX

Ron:

Thanks for the information regarding the great Pacific opening. The ZD9SXW signal was impressive on 40 and 80 meters in the central USA. Roger's signal was not loud at all on 160 meters and I don't think many W/VE's got in the log. His operating ability is about as good as it gets. Although the 1.844 DX net is a problem, you have provided our readers with some keen insight about the 160 meter band in Europe. I hope you pull off the FK8CP contact - quite a catch from the UK.

Lance:

My 80 meter antenna at this time is an inverted vee with the apex at about 18 meters. I'm in the process of feeding the tower for 80 and 160 meters. I am in the city of Pretoria and have lots of noise and telephone interference problems. I'm hoping to pull together something during December, but it is tentative. If ZS9 is still RSA territory then, that's my prime target. V5 is also attractive. I always have lots of low band stuff ("Battle Creek Special" Mark-I lives in my store) Previous outings include ZS3Z, ZS9Z, ZS0Z, V51Z, ZS9Z/ZS1, 3DA0/ZS6BCR and 7P8EN using Bernies license. I don't stay at the station, so I do not get on much outside of contests. Best regards.

Chris, ZS6EZ

Chris:

I hope you will keep in touch with us. You have been a very bright light to hundreds of low band DXers around the world and conditions are getting better. Hope to work you in the CQWWCW in November.

Lance:

Here's some additional information about the "Battle Creek Special" low band antenna. We do not provide the series capacitor to tune out the inductive reactance for 75 meter operation - users would provide their own. The latest version, with lower loss traps, will now take a full KW on RTTY. Our key down tests warmed the traps to only 100° F at over a KW for 2 minutes on all 3 bands. We actually put down 32 radials about 66 feet long in my yard and tie them to a copper buss strap so we can test any "Battle Creek Special" without having to lay out a ground plane. I set my lawn tractor deck for the lowest possible setting and cut the grass. The radials made of #20 wire, were then laid out with a #16 nail at the outside end of each wire to hold them down. High points were "stapled" down to the grass using 2" staples made for nailing chicken wire to fence posts. After about three weeks of growth the radials were almost impossible to see, even with yellow insulation. On 9 Oct 1993, ZD9SXW was on 160 meters and worked W0ZV/4 and a few others. On Sunday, before 2300Z ZD9SXW was on 1829.5 listening up 2 and worked KD9SV and K9UWA just before their sundown. The received signals were thin, even with four squares and phased 700 foot Beverages at KD9SV's. Apparently Roger is using a GAP antenna on 80 and 160 meters. Although G3SXW traveled to ZD9 via South Africa, he did not pick up the "Battle Creek Special" from Chris, ZS6EZ as we had hoped. Referencing to the JA group at 3D2, we got a two minute opening here in Michigan on 160 meters and W0CD worked them. I missed them by about ten seconds. Does anyone know what antenna they were using on 160 meters? Would your readers be interested in an Inverted L Antenna article.?

George, K8GG

George:

Great stuff! You have to wonder if that 100° F heat will present a problem for the "Battle Creek Special" when it's being utilized from Peter I Island. We greatly appreciate your insights regarding the antenna's development. Serious 160 meter operators are at the point now where they can almost predict whether the DXpedition station is with or without a "Battle Creek Special". The ZD9SXW signal on 160 meters was not what I thought it should be -

maybe the propagation gods were not with the program? I was expecting something on the order of a ZD8Z type of signal. KD9SV and K9UWA are to be congratulated - they join a very exclusive group. Roger wrote us earlier and said he would summarize his experiences when he returns. I have requested information from the 3D2 group, but have not received anything yet. The Inverted L antenna article would be of great interest. This system is certainly not optimum, but it is certainly a viable choice for those that lack a lot of real estate.

Lance:

I am the world's worst artist. Please tell everyone that George, K8GG, not I drew the sketches of the "Battle Creek Special" in the September *Low Band Monitor.*

Charles, W0CD

Charles:

Sorry for the mix up. I am sure that each member of the group has made his own unique contribution. K8GG's drawings answered a lot of questions everyone had about the system. We have received over a dozen positive comments about the article and appreciate your efforts. I wonder if the product has commercial potential for the stateside user?

Lance:

I am currently operating from a 200' x 200' lot at 150' above sea level. I use a home brew Windom for 160, 80 and 40 meters. It is a single 130' flat top fed with a single wire at the 80' - 50' point. The fed wire is 70' long and terminates at a 20 wire radial system. I also have a full size inverted vee at 70' for 160 meters. I am using a Yaesu FT-902DM and no amplifier - they are not allowed in Singapore. I listen almost every day on 1.824 khz. at 1200 - 1400Z and at 2230 - 2245Z. I do not operate in the major DX Contests because I cannot compete with the QRM. Our biggest concern is the Indonesian operators that use 7.000 - 7.010 khz. for SSB. This really hurts ones operating style from Southeast Asia. My first stateside contact on 160 meters this season was with Pres, N6SS on 1 Oct 1993 at 1300Z. He was a good 559 to 569.

Gus, 9V1ZE (K4SXT)

Gus:

Very pleased to hear from you. The truly accomplished DXers in this part of the USA have been able to work you. Many still need 9V on 80 and 160 meters, so we will be actively listening this winter. N6SS is in Arizona, so your FT-902DM is being heard inland on 160 meters. Thanks for the picture of your QTH - I will run it in a future issue. Perhaps you could surprise us in the CQWWCW at Elizabeth, Colorado sunrise on Sunday morning! I will pass the word to our readers.

Lance:

I am currently using a shunt fed 12 meter tower, topped with a TH6-DXX for my 160 meter work My transceiver is a Kenwood TS-440S and the linear is a Heath SB-220. I am always on near my sunrise and some weekends I am on in the late evening. I am looking intently for Pacific stations on 160 meters and will advise you if any DXpedition activity is planned. I am on ZSUTX @ ZS0BFN.ZAF.AF. Since I am on a 30 meter by 50 meter city lot I am interested in articles regarding receiving antennas of reduced size.

Bernie, ZS4TX

Bernie:

Thanks for your input and congratulations on completing your 5 Band WAZ, a real accomplishment. We will try to come up with some receiving loop articles in the future. Perhaps I should reprint Mike Crabtree's, AB0X, article that was featured in CQ Magazine a number of years ago. Mike worked over 150 countries on 160 meters from the state of Kansas, on a city lot, using a loop oriented around the perimeter of his home.

Lance:

Very impressed with the *Low Band Monitor*. I am the new editor of *The DXer*, the monthly newsletter of the Northern California DX Club. I plan to run a positive article about your publication in the November issue. The "Battle Creek Special" article answered a number of questions for me - I always wondered what one looked like.

Garry, NI6T

Garry:

Thanks for the publicity. The Northern California DX Club truly experiences a different set of propagation paths than the rest of the country. We would certainly appreciate any insights your group might have. Your newsletter has always been excellent - continued success with your efforts. Drop me a note if I can send you a few samples of the Low Band Monitor for Visalia in April.

Lance:

In July my family took possession of a new QTH on three acres in a small Iowa town. I am currently working on a tower and associated low band antennas. 5 Band DXCC was achieved in the 70's but I am now just getting back to serious low band operating. I was on the low bands a bit from KM6BI on Midway in 1965 and 1966. I was also an operator from KR6CB at Camp Kinser, Okinawa but didn't get to use the 700 foot rhombic! Our Seabee unit pulled out so fast we had to leave a 204BA at 90' and a Ham-M rotor behind. I hope to pick up a few new ones during the CQWWDX Test.

Clay, WA0GFS

Clay:

Thanks for the band data. You have a nice foundation to build on with the 5 Band DXCC under your belt. Hopefully the winter season will cooperate with us this year. A 160 meter shunt fed tower might complement that DB-24, when you get your tower up.

Lance:

My 160 meter total is 218 with all zones worked except 34. I only use 80 and 40 meters to make schedules on 160 meters! I currently use a phase fed 4-way 1/2 wavelength sloper system, off a 140' tower for transmit on 160 meters. For receive I use a miniature 4-square vertical array 1/2 wavelength (34' high). I am contemplating a 160 meter wire yagi at 165' for this winter. Just want to try it!

John, K9UWA

John:

Absolutely outstanding! The miniature 4-square sounds interesting. We would like additional details when you have the time. When you consider that you are located in Indiana, these totals are even more impressive. Thanks for your interest in the Low Band Monitor and congratulations on making a ZD9SXW contact on 160 meters.

Lance:

W0CP advised that you had some information on the "Battle Creek Special" and were doing a Low Band Newsletter. Please send information to Connecticut.

Jack, W1WEF

Jack:

Thanks for your interest! I didn't know that they were still low band DXing in Connecticut. I thought you folks worked all the stuff during the last sunspot minimum and were concentrating on satellites and moonbounce.

Lance:

I am putting the finishing touches on a 3 element rotary wire beam on 80 meters to complement my G5RV. The 160 meter antenna is an inverted L. I use a KWM-2A and 32S3 along with a 75S3 Receiver and an Icom-725 for backup. The amplifier is a Gates Harris HFL-1000 (4CX1000A) and a homebrew 4-1000. I will be active on 160 meters when I get some repairs completed. I am looking for Zone 22 and 23 on 40 meters and Zone 22, 23, 26 and 34 on 80 meters. I may be active in the CQWW on 80 meters if I can complete the array. I am looking at an operation to Meangura Island (YS9) at a future date for the I.O.T.A. enthusiast, but it is in the planning stage at this time. I would like to see articles about small size receiving loop antennas for low band work

Andy, YS1AG (ex G5AYU, YN5AG)

LETTERS - LETTERS - LETTERS - LETTERS - LETTERS

Andy:

Thanks for your input. At 280 and 210 on 40 and 80, meters you should have no problem adapting to 160 meter conditions. You have the potential to be a world class factor on 80 meters this season and could be a force on 160 meters. Best luck with your array!

Lance:

I am using two half waves in phase for 80 meters and the same antenna for 160 meters. This antenna is 20 meters high and is fed with open wire line. I use a small loop for receiving. The transceiver here is an Icom 761. I also use a Kenwood TL-922 linear. I am looking for Zones 1,2 and 3 on 80 meters and 40 meter CW. I am on the 160 meter band on most weekends. I have too much noise and am looking for a good DSP - Hi-Hi.

Manolis, SV1AOZ

Manolis:

You have an excellent 80 meter signal, because I have heard it a number of times in Colorado. Zone 3 should be easy for you, but Zone 1 and 2 will present some real challenge. At 150-130-55 since 1991, you are obviously focused on low band work. Most of our readers need SV on 160 meters. You will be very popular this winter.Hope to hear from you again.

Lance:

The "Battle Creek Special" looks interesting. Did W0CD send the 40 and 80 meter trap details with the article? I would like to try building one for my city lot in Longmont, Colorado.

John, K1ER

John:

No specific details were provided on the 40 and 80 meter traps, although the ARRL Antenna Book might give you a starting point. I would send W0CD a note and perhaps a small donation to the "Battle Creek Special" building fund at: Charles Dewey, 49 Lynwood Drive, Battle Creek, MI 49017. Move to Elizabeth, Colorado. We just got our first paved street and if you buy two chickens they call you a rancher and your taxes are cut in half!

Lance:

Thanks for the prompt service. This is great reading, something like this has been needed for a long time. I am leaving for an extended trip to YB, 9V, VS6, BY, and JA. I have provided a few spots for you, but have been quite busy preparing for the trip. Some of your readers might want to know that on January 22, 1993 I worked 9K2ZZ on 160 meters at 0050Z. Since he had a stateside QSL manager, I had the card in around 10 days.

Merv, K9FD

Merv:

Thanks for the nice comments. I hope that your trip is successful and would guess that most of our readers need at least three of your stops on 160 meters. I will also tell our readers that you made a second 160 meter QSO with 9K2ZZ on the following day, as no one else was calling him! That is one of the best 160 meter QSO's I have ever heard of to the midwest part of the USA.

Lance:

Sign me up for the *Low Band Monitor.* I need Peter I and Bhutan on 40 meters and Peter I, 9U5, A5, P5, VK9X, ZL8 and Heard Island on 80 meters. My 160 meter scores are down! I would be glad to contribute to the effort.

Bill, K2TQC

Bill:

Thank you for the subscription. Your totals speak for themselves. Many of our readers would appreciate your insights. We have low band enthusiasts that are entry level, mid level, accomplished and professional broadcast level. Some of our readers are in town houses, small city lots, small rural acreages and large rural acreages. The information that our readers provide will usually help someone in this very diverse group.

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160 METERS

1832.0	ZF2JI	31-Oct-1993	1013Z
1839.0	KH6AT	31-Oct-1993	1006Z
1830.1	VP5N	31-Oct-1993	0907Z
1829.0	P40L	31-Oct-1993	0845Z
1828.0	AL7MX	31-Oct-1993	0825Z
1829.0	KL7Y	31-Oct-1993	0823Z
1832.0	V7X	31-Oct-1993	0719Z
1824.0	HC0E	31-Oct-1993	0712Z
1838.0	FJ5AB	31-Oct-1993	0609Z
1836.7	C6AFT	31-Oct-1993	0601Z
1824.1	P49T	31-Ocy-1993	0509Z
1832.2	VP5L	31-Oct-1993	0452Z
1839.9	KH6CC	31-Oct-1993	0451Z
1830.0	VP2EC	31-Oct-1993	0449Z
1835.9	V31DX	31-Oct-1993	0509Z
1830.6	XE2DV	31-Oct-1993	0507Z
1826.8	V26B	31-Oct-1993	0458Z
1830.1	VP2EC	31-Oct-1993	0441Z
1840.0	KH6CC	31-Oct-1993	0439Z
1835.0	PJ1B	31-Oct-1993	0429Z
1847.0	J37K	31-Oct-1993	0409Z
1830.8	KP2A	31-Oct-1993	0352Z
1834.0	YV1DRK	31-Oct-1993	0342Z
1824.9	V47KP	31-Oct-1993	0328Z
1840.0	HH2PK	31-Oct-1993	0219Z
1839.0	YS1X	31-Oct-1993	0245Z
1829.4	VP2VFP	31-Oct-1993	0235Z
1832.0	9Y4H	31-Oct-1993	0211Z
1832.0	4X4NJ	31-Oct-1993	0210Z
1840.0	HH2PK	31-Oct-1993	0219Z
1832.3	9Y4H	31-Oct-1993	0216Z
1841.0	VP5L	31-Oct-1993	0149Z
1834.3	KP2A	31-Oct-1993	0139Z
1838.6	PJ1B	31-Oct-1993	0137Z
1840.0	EA3JE	31-Oct-1993	0101Z
1840.0	VP2EC	31-Oct-1993	0055Z
1830.9	ZB2X	31-Oct-1993	0054Z
1836.4	CU2T	30-Oct-1993	2317Z
1830.0	KV4FZ	30-Oct-1993	0910Z
1827.4	9Y4H	30-Oct-1993	0906Z
1827.5	V31DX	30-Oct-1993	0956Z
1830.0	KV4FZ	30-Oct-1993	0910Z
1827.4	9Y4H	30-Oct-1993	0911Z
1830.0	KV4FZ	30-Oct-1993	0910Z
1827.4	9Y4H	30-Oct-1993	0911Z
1827.4	9Y4H	30-Oct-1993	0906Z
1833.0	V26B	30-Oct-1993	0623Z
1835.1	P49T	30-Oct-1993	0727Z
1844.0	HC0E	30-Oct-1993	0614Z
1824.8	XE2DV	30-Oct-1993	0708Z
1845.1	YV1DRK	30-Oct-1993	0704Z
1840.8	HC0E	30-Oct-1993	0704Z
1836.2	CH9DH	30-Oct-1993	0555Z
1831.7	VP5N	30-Oct-1993	0641Z
1844.9	YV1DRK	30-Oct-1993	0640Z
1829.1	V31DX	30-Oct-1993	0635Z
1838.0	KP2A	30-Oct-1993	0631Z
1835.1	VP5L	30-Oct-1993	0630Z
1830.0	VP2EC	30-Oct-1993	0629Z
1833.0	V26B	30-Oct-1993	0623Z
1815.0	GW3YDX	30-Oct-1993	0622Z
1845.0	AH9B/VO2	30-Oct-1993	0620Z
1821.9	GW3YDX	30-Oct-1993	0621Z
1843.9	HC0E	30-Oct-1993	0612Z
1828.6	VP5N	30-Oct-1993	0602Z
1833.0	V26B	30-Oct-1993	0559Z
1829.9	VP5L	30-Oct-1993	0550Z
1845.0	VP2EC	30-Oct-1993	0534Z
1838.5	9Y4H	30-Oct-1993	0520Z
1833.0	V26B	30-Oct-1993	0519Z
1836.0	P40W	30-Oct-1993	0518Z
1834.0	EI7M	30-Oct-1993	0508Z
1825.0	8R1K	30-Oct-1993	0502Z
1834.0	KH6CC	30-Oct-1993	0459Z
1828.0	HK0HEU	30-Oct-1993	0340Z
1834.0	VP5L	30-Oct-1993	0318Z
1830.0	YS1X	30-Oct-1993	0316Z
1824.0	HH2PV	30-Oct-1993	0007Z

75 METERS

3792.3	4M5B	31-Oct-1993	2325Z	
3793.0	EA9UK	31-Oct-1993	2323Z	
3794.7	CO2PX	31-Oct-1993	2319Z	
3789.6	TO5MM	31-Oct-1993	2311Z	
3788.6	CH3EJ	31-Oct-1993	2313Z	
3786.8	UW2F	31-Oct-1993	2309Z	
3789.8	TU5DX	31-Oct-1993	2226Z	
3796.5	VP9MZ	31-Oct-1993	2203Z	
3794.2	EA9UK	31-Oct-1993	2159Z	806
3797.9	VK6LK	31-Oct-1993	2153Z	
3791.0	XE2DV	31-Oct-1993	1239Z	
3779.3	8R1K	31-Oct-1993	0610Z	
3764.0	4O7AV	31-Oct-1993	0455Z	
3729.2	OK2FD	31-Oct-1993	0453Z	840
3723.2	G3PPG	31-Oct-1993	0453Z	806
3768.8	S52CD	31-Oct-1993	0451Z	847
3510.9	F5IN	31-Oct-1993	0448Z	
3770.0	DL3OI	31-Oct-1993	0446Z	
3754.5	KP2A	31-Oct-1993	0444Z	
3763.9	4O7AV	31-Oct-1993	0443Z	
3789.0	ED3DU	31-Oct-1993	0443Z	
3794.5	VP2EC	31-Oct-1993	0442Z	
3734.1	OT3T	31-Oct-1993	0442Z	831
3743.4	DL4KQ	31-Oct-1993	0503Z	848
3701.4	CU2T	31-Oct-1993	0440Z	816
3697.8	F6FAW	31-Oct-1993	0501Z	828
3734.0	OT3T	31-Oct-1993	0438Z	831
3709.0	ON6AH	31-Oct-1993	0456Z	821
3701.5	CU2T	31-Oct-1993	0455Z	828
3776.9	V31DX	31-Oct-1993	0439Z	
3773.0	5K3W	31-Oct-1993	0448Z	
3704.0	IU2X	31-Oct-1993	0436Z	830
3738.8	S51OJ	31-Oct-1993	0431Z	844
3715.8	EA8AH	31-Oct-1993	0357Z	871
3761.2	EA9UK	31-Oct-1993	0354Z	
3709.2	ON6AH	31-Oct-1993	0352Z	822
3695.5	PA3FNE	31-Oct-1993	0353Z	818
3712.0	ER1M	31-Oct-1993	0349Z	
3751.6	HK0HEU	31-Oct-1993	0344Z	
3751.4	KP2A	31-Oct-1993	0343Z	
3686.0	GI0KOW	31-Oct-1993	0341Z	835
3720.0	UW2F	31-Oct-1993	0341Z	829
3784.9	HH2PK	31-Oct-1993	0339Z	
3725.4	GM0ECO	31-Oct-1993	0335Z	836
3780.0	HC0E	31-Oct-1993	0332Z	
3829.5	KG4CB	31-Oct-1993	0327Z	
3792.7	ZF2JI	31-Oct-1993	0327Z	
3789.2	9Y4H	31-Oct-1993	0324Z	
3753.1	PJ8CW	31-Oct-1993	0320Z	
3785.9	OM3NA	31-Oct-1993	0316Z	
3770.5	PJ1B	31-Oct-1993	0316Z	
3763.2	EA8AH	31-Oct-1993	0313Z	
3790.7	P49T	31-Oct-1993	0310Z	
3786.0	HB0/DL6GY	31-Oct-1993	0307Z	819
3770.7	PJ1B	31-Oct-1993	0251Z	
3686.0	IT9HBT	31-Oct-1993	0251Z	822
3735.6	9Y4H	31-Oct-1993	0247Z	779
3700.7	EA8AH	31-Oct-1993	0244Z	871
3763.4	EA9UK	31-Oct-1993	0244Z	
3756.7	TI1C	31-Oct-1993	0241Z	
3785.3	YS1X	31-Oct-1993	0159Z	
3797.5	VP9GD	31-Oct-1993	0156Z	
3791.0	EA9UK	31-Oct-1993	0154Z	
3728.2	UB5UT	31-Oct-1993	0147Z	821
3775.1	VP5L	31-Oct-1993	0141Z	
3705.1	EA6ARM	31-Oct-1993	0138Z	824
3807.0	V26B	31-Oct-1993	0135Z	
3792.0	P49T	31-Oct-1993	0132Z	815
3785.6	YS1X	31-Oct-1993	0129Z	
3797.7	4M1X	31-Oct-1993	0126Z	
3794.3	V31DX	31-Oct-1993	0124Z	
3795.0	HG73DX	31-Oct-1993	0058Z	824
3799.1	S57CW	31-Oct-1993	0001Z	
3802.0	VP2EC	30-Oct-1993	2359Z	
3800.0	FM5WD	31-Oct-1993	0000Z	
3791.2	HC0E	30-Oct-1993	2354Z	
3802.0	VP2EC	30-Oct-1993	2348Z	
3754.1	4M1DX	30-Oct-1993	2344Z	

75 METERS

3786.3	9A1A	30-Oct-1993	2341Z	
3769.6	S51OJ	30-Oct-1993	2303Z	
3797.6	VP5L	30-Oct-1993	2303Z	
3795.4	HG73DX	30-Oct-1993	2219Z	
3786.1	WR6R/KH6	30-Oct-1993	1311Z	
3795.2	VK2BEX	30-Oct-1993	1221Z	
3798.0	VK9LI	30-Oct-1993	1213Z	778
3769.2	ZF2JI	30-Oct-1993	1149Z	
3795.6	6Y5IC	30-Oct-1993	1103Z	
3775.7	TI1C	30-Oct-1993	1102Z	
3773.3	V7X	30-Oct-1993	1100Z	
3776.9	VP2VFP	30-Oct-1993	0925Z	
3770.1	V47KP	30-Oct-1993	1042Z	
3783.2	HC0E	30-Oct-1993	0920Z	
3780.1	ZF2JI	30-Oct-1993	1037Z	
3791.6	4M5B	30-Oct-1993	0900Z	
3776.0	T49AB	30-Oct-1993	0732Z	
3774.0	V26B	30-Oct-1993	0911Z	
3783.2	HC0E	30-Oct-1993	1036Z	
3770.8	FY5FY	30-Oct-1993	0727Z	
3786.5	P40W	30-Oct-1993	0908Z	
3783.2	HC1E	30-Oct-1993	1034Z	
3780.7	P40L	30-Oct-1993	0854Z	
3774.0	V26B	30-Oct-1993	0907Z	
3761.9	ZF2JI	30-Oct-1993	0726Z	
3756.5	VP2EC	30-Oct-1993	0902Z	
3783.0	HC0E	30-Oct-1993	0848Z	
3796.0	FJ5AB	30-Oct-1993	0858Z	
3778.0	VP2VFP	30-Oct-1993	0845Z	
3794.5	KP2A	30-Oct-1993	1014Z	
3789.2	VP2VFP	30-Oct-1993	0808Z	
3793.1	4M5B	30-Oct-1993	0648Z	
3772.9	TM2Y	30-Oct-1993	0646Z	
3791.1	EA8AH	30-Oct-1993	0752Z	
3786.1	FJ5AB	30-Oct-1993	0750Z	
3758.6	PJ1B	30-Oct-1993	0746Z	
3754.8	V47KP	30-Oct-1993	0744Z	
3805.6	WR6R/KH6	30-Oct-1993	0933Z	
3793.1	4M5B	30-Oct-1993	0738Z	
3792.0	TF3BM	30-Oct-1993	0934Z	
3805.5	WR6R/KH6	30-Oct-1993	0934Z	
3776.9	VP2VFP	30-Oct-1993	0925Z	
3786.5	P40W	30-Oct-1993	0908Z	
3776.6	VP2VFP	30-Oct-1993	0921Z	
3783.2	HC0E	30-Oct-1993	0920Z	
3813.8	VB2MCZ	30-Oct-1993	0734Z	
3791.6	4M5B	30-Oct-1993	0900Z	
3780.7	P40L	30-Oct-1993	0854Z	
3774.0	V26B	30-Oct-1993	0911Z	
3756.5	VP2EC	30-Oct-1993	0902Z	
3776.0	T49AB	30-Oct-1993	0732Z	
3786.5	P40W	30-Oct-1993	0908Z	
3785.6	VY9QR	30-Oct-1993	0856Z	
3770.8	FY5FY	30-Oct-1993	0727Z	
3780.7	P40L	30-Oct-1993	0854Z	
3756.5	VP2EC	30-Oct-1993	0902Z	
3761.9	ZF2JI	30-Oct-1993	0726Z	
3776.0	VP5N	30-Oct-1993	0902Z	
3763.0	4U48UN	30-Oct-1993	0724Z	
3755.0	V47KP	30-Oct-1993	0719Z	
3779.0	TF3T	30-Oct-1993	0713Z	
3779.0	8R1K	30-Oct-1993	0709Z	
3780.0	HC0E	30-Oct-1993	0704Z	
3789.0	YS1X	30-Oct-1993	0658Z	
3797.2	P49T	30-Oct-1993	0653Z	
3754.0	ZF1JI	30-Oct-1993	0813Z	
3756.8	XE2DV	30-Oct-1993	0817Z	
3785.9	FJ5AB	30-Oct-1993	0815Z	
3783.8	XE3RKK	30-Oct-1993	0809Z	
3789.2	VP2VFP	30-Oct-1993	0808Z	
3754.8	V47KP	30-Oct-1993	0744Z	
3793.1	4M5B	30-Oct-1993	0648Z	
3772.9	TM2Y	30-Oct-1993	0646Z	
3791.1	EA8AH	30-Oct-1993	0752Z	
3786.1	FJ5AB	30-Oct-1993	0750Z	
3758.6	PJ1B	30-Oct-1993	0746Z	
3758.8	EA3RKG	30-Oct-1993	0645Z	
3754.8	V47KP	30-Oct-1993	0744Z	

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3796.3	8R1K	30-Oct-1993	0747Z	
3797.0	P40W	30-Oct-1993	0744Z	
3770.7	FY5FY	30-Oct-1993	0752Z	767
3783.9	XE3RKK	30-Oct-1993	0740Z	
3761.9	ZF2JI	30-Oct-1993	0739Z	
3763.4	CO2PX	30-Oct-1993	0623Z	
3703.0	4U1ITU	30-Oct-1993	0622Z	817
3716.5	G3KMA	30-Oct-1993	0622Z	858
3793.5	4M5B	30-Oct-1993	0620Z	
3764.0	HC0E	30-Oct-1993	0728Z	
3710.0	IV3TAN	30-Oct-1993	0619Z	830
3755.0	V47KP	30-Oct-1993	0721Z	
3743.0	PA3FNE	30-Oct-1993	0617Z	839
3758.4	V47NS	30-Oct-1993	0724Z	
3710.0	IT3TAN	30-Oct-1993	0615Z	830
3712.6	LX0RL	30-Oct-1993	0616Z	803
3785.1	V31DX	30-Oct-1993	0611Z	
3750.1	EA8AH	30-Oct-1993	0614Z	
3797.3	CU2T	30-Oct-1993	0719Z	
3735.4	VP2EC	30-Oct-1993	0613Z	848
3743.0	PA3FNE	30-Oct-1993	0610Z	827
3786.9	ED3DU	30-Oct-1993	0609Z	819
3795.4	TM7C	30-Oct-1993	0714Z	
3786.7	FJ5AB	30-Oct-1993	0711Z	
3755.0	V47KP	30-Oct-1993	0708Z	
3799.0	4M1DX	30-Oct-1993	0703Z	
3741.5	P40L	30-Oct-1993	0704Z	813
3789.6	YS1X	30-Oct-1993	0704Z	820
3795.2	T97C	30-Oct-1993	0703Z	
3772.1	PJ1B	30-Oct-1993	0713Z	
3793.1	4M5B	30-Oct-1993	0702Z	
3785.0	V31DX	30-Oct-1993	0555Z	
3726.1	PI4COM	30-Oct-1993	0553Z	833
3744.9	9Y4H	30-Oct-1993	0638Z	809
3724.6	GM0ECO	30-Oct-1993	0636Z	839
3776.1	PJ1B	30-Oct-1993	0635Z	
3755.6	NP2V	30-Oct-1993	0636Z	
3708.5	G0KPW	30-Oct-1993	0635Z	849
3732.0	GW4BLE	30-Oct-1993	0633Z	829
3670.0	OH0DX	30-Oct-1993	0628Z	
3768.2	TI1C	30-Oct-1993	0631Z	
3762.0	OK2FD	30-Oct-1993	0629Z	
3771.2	OT3T	30-Oct-1993	0637Z	
3735.6	HJ6SQQ	30-Oct-1993	0626Z	
3768.2	TI1C	30-Oct-1993	0625Z	
3773.1	TM3Y	30-Oct-1993	0636Z	
3716.5	G3KMA	30-Oct-1993	0622Z	858
3735.3	VP2EC	30-Oct-1993	0624Z	
3763.4	CO2PX	30-Oct-1993	0623Z	
3793.5	4M5B	30-Oct-1993	0620Z	
3703.0	4U1ITU	30-Oct-1993	0622Z	817
3767.1	G3SNN	30-Oct-1993	0617Z	
3752.0	TO5MM	30-Oct-1993	0617Z	
3773.4	XE3RKK	30-Oct-1993	0615Z	
3710.0	IV3TAN	30-Oct-1993	0614Z	830
3750.1	EA8AH	30-Oct-1993	0614Z	
3785.1	V31DX	30-Oct-1993	0611Z	
3786.9	ED3DU	30-Oct-1993	0609Z	819
3780.9	P40W	30-Oct-1993	0611Z	
3797.3	P49T	30-Oct-1993	0609Z	
3758.2	ED3RCL	30-Oct-1993	0608Z	
3787.1	ED3DU	30-Oct-1993	0618Z	
3780.8	NP2V	30-Oct-1993	0604Z	
3777.8	KP2A	30-Oct-1993	0604Z	
3792.1	VP5L	30-Oct-1993	0614Z	
3798.4	9A1A	30-Oct-1993	0610Z	
3789.7	YS1X	30-Oct-1993	0607Z	
3758.0	ED6RCL	30-Oct-1993	0556Z	
3760.0	4U48UN	30-Oct-1993	0553Z	
3742.8	PA3FNE	30-Oct-1993	0555Z	845
3750.2	EA8AH	30-Oct-1993	0553Z	
3736.7	ZB2X	30-Oct-1993	0549Z	808
3730.2	OK2FD	30-Oct-1993	0549Z	830
3755.3	EA9UK	30-Oct-1993	0539Z	
3672.2	OM3KAG	30-Oct-1993	0534Z	843
3732.7	UW2F	30-Oct-1993	0533Z	
3797.5	P49T	30-Oct-1993	0532Z	
3733.0	OE2XEL	30-Oct-1993	0524Z	846

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3698.0	ZF2JI	30-Oct-1993	0522Z	814
3752.7	HA9BVK	30-Oct-1993	0518Z	844
3763.6	CO2PX	30-Oct-1993	0520Z	
3771.0	OT3T	30-Oct-1993	0516Z	
3761.4	S52CD	30-Oct-1993	0515Z	
3768.1	TI1C	30-Oct-1993	0512Z	
3756.6	HG73DX	30-Oct-1993	0513Z	
3709.8	G0KPW	30-Oct-1993	0504Z	847
3698.8	OK5W	30-Oct-1993	0504Z	833
3769.2	ED1WW	30-Oct-1993	0457Z	
3737.5	S51OJ	30-Oct-1993	0458Z	840
3727.6	DL0WW	30-Oct-1993	0456Z	829
3678.5	UB5UT	30-Oct-1993	0451Z	
3648.0	4U1ITU	30-Oct-1993	0450Z	809
3791.2	V31DX	30-Oct-1993	0451Z	
3726.2	TM2Y	30-Oct-1993	0442Z	829
3720.5	VP2EC	30-Oct-1993	0433Z	835
3699.0	OK5W	30-Oct-1993	0435Z	834
3789.0	GW4BLE	30-Oct-1993	0435Z	
3698.0	PI5COM	30-Oct-1993	0433Z	833
3673.4	GM0ECO	30-Oct-1993	0424Z	838
3672.0	EA3CWT	30-Oct-1993	0423Z	810
3757.4	IV3TAN	30-Oct-1993	0412Z	
3771.7	TM7C	30-Oct-1993	0414Z	
3761.3	S52CD	30-Oct-1993	0412Z	
3745.1	9A1A	30-Oct-1993	0408Z	863
3759.9	TO5MM	30-Oct-1993	0411Z	

40 METERS

7057.0	TI1C	31-Oct-1993	2359Z	174
7078.4	ED3TR	31-Oct-1993	2329Z	202
7059.5	OH2X	31-Oct-1993	2349Z	193
7042.2	C6AFT	31-Oct-1993	2343Z	168
7073.2	HB0/DF3GY	31-Oct-1993	2323Z	203
7023.1	TU5DX	31-Oct-1993	2326Z	194
7073.2	HB0/DF3GY	31-Oct-1993	2321Z	203
7047.0	LU4FM	31-Oct-1993	2320Z	207
7022.9	TU5DX	31-Oct-1993	2315Z	269
7082.6	5N0MVE	31-Oct-1993	2309Z	164
7084.0	UW2F	31-Oct-1993	2313Z	229
7050.7	PJ9U	31-Oct-1993	2246Z	283
7050.0	PJ9U	31-Oct-1993	2226Z	283
7061.0	T49AB	31-Oct-1993	2203Z	239
7082.8	5N0MVE	31-Oct-1993	2159Z	228
7058.5	PJ9U	31-Oct-1993	2155Z	254
7050.2	VK9NS	31-Oct-1993	1246Z	193
7056.9	ZF2JI	31-Oct-1993	1244Z	200
7051.2	VK3AJJ	31-Oct-1993	1244Z	243
7059.1	VP5L	31-Oct-1993	1241Z	235
7041.2	P29KH	31-Oct-1993	1248Z	266
7053.5	VK6HD	31-Oct-1993	1237Z	223
7045.6	JJ3YBB	31-Oct-1993	1220Z	218
7082.6	KL7Y	31-Oct-1993	1215Z	168
7050.0	VK9NS	31-Oct-1993	1202Z	193
7065.0	ZL2BCG	31-Oct-1993	1158Z	157
7059.0	VK9NS	31-Oct-1993	1156Z	193
7081.2	FJ5AB	31-Oct-1993	1143Z	290
7044.0	HK0HEU	31-Oct-1993	1133Z	205
7092.3	VP9EP	31-Oct-1993	1117Z	238
7079.4	N6VI/KH6	31-Oct-1993	1112Z	287
7078.0	V26B	31-Oct-1993	1106Z	235
7078.4	VK3TZ	31-Oct-1993	1102Z	190
7082.0	V7X	31-Oct-1993	1057Z	174
7047.0	VP5L	31-Oct-1993	1028Z	207
7044.0	VK3AJJ	31-Oct-1993	1021Z	235
7067.4	P49T	31-Oct-1993	0841Z	190
7066.0	VK9LI	31-Oct-1993	0649Z	187
7053.0	VK9NS	31-Oct-1993	0626Z	185
7064.0	OH2X	31-Oct-1993	0622Z	230
7099.0	CR3M	31-Oct-1993	0525Z	275
7061.1	XA5T	31-Oct-1993	0524Z	238
7084.0	ZF2JI	31-Oct-1993	0450Z	274
7075.0	GI0KOW	31-Oct-1993	0456Z	199
7084.0	9A1A	31-Oct-1993	0444Z	270
7077.6	ZB2X	31-Oct-1993	0520Z	272
7055.2	FM5BH	31-Oct-1993	0450Z	250

40 METERS

7066.2	HB9AAA	31-Oct-1993	0442Z	224
7055.7	IR2W	31-Oct-1993	0440Z	270
7083.0	LU4FM	31-Oct-1993	0442Z	164
7086.0	S59AB	31-Oct-1993	0451Z	270
7084.0	9A1A	31-Oct-1993	0450Z	270
7065.7	OE2XEL	31-Oct-1993	0450Z	290
7043.1	TI1C	31-Oct-1993	0445Z	207
7029.0	VP2EJ	31-Oct-1993	0448Z	199
7079.0	IQ3A	31-Oct-1993	0436Z	289
7038.6	VP2EC	31-Oct-1993	0446Z	264
7048.5	VP5L	31-Oct-1993	0443Z	204
7055.8	IR2W	31-Oct-1993	0442Z	270
7058.4	ED4RDT	31-Oct-1993	0440Z	224
7058.0	CT7D	31-Oct-1993	0440Z	205
7074.0	ZS9/ZS4NS	31-Oct-1993	0433Z	288
7094.0	ZS6EZ	31-Oct-1993	0407Z	194
7031.8	TM2Y	31-Oct-1993	0404Z	259
7049.4	HZ1AB	31-Oct-1993	0348Z	174
7096.5	4U1ITU	31-Oct-1993	0345Z	218.
7040.0	EA8OR	31-Oct-1993	0330Z	275
7093.0	TK5MH	31-Oct-1993	0319Z	248
7097.0	ZB2X	31-Oct-1993	0305Z	270
7094.0	HZ1AB	31-Oct-1993	0257Z	174
7057.3	PJ1B	31-Oct-1993	0217Z	264
7098.0	OE2XEL	31-Oct-1993	0219Z	274
7025.0	CH9DH	31-Oct-1993	0245Z	244
7045.9	EA9UK	31-Oct-1993	0246Z	175
7029.0	OE6CLD	31-Oct-1993	0244Z	189
7032.0	LX0RL	31-Oct-1993	0244Z	274
7032.7	LX2RL	31-Oct-1993	0241Z	274
7052.9	ZF2JI	31-Oct-1993	0234Z	202
7057.3	PJ1B	31-Oct-1993	0217Z	264
7098.0	OE2XEL	31-Oct-1993	0219Z	274
7027.0	ZD8VJ	31-Oct-1993	0203Z	204
7027.0	ZD8VJ	31-Oct-1993	0203Z	204
7092.0	NP2V	31-Oct-1993	0200Z	219
7084.9	HG73KX	31-Oct-1993	0200Z	280
7084.9	TK5MH	31-Oct-1993	0156Z	207
7058.8	PJ9U	31-Oct-1993	0157Z	283
7092.0	NP2V	31-Oct-1993	0155Z	219
7052.0	OT3T	31-Oct-1993	0155Z	250
7043.9	ED3DU	31-Oct-1993	0149Z	281
7071.3	HB0/DF3GY/P	31-Oct-1993	0147Z	198
7043.2	OM3KFF	31-Oct-1993	0146Z	270
7063.2	OZ1BTE	31-Oct-1993	0143Z	186
7042.0	IQ4A	31-Oct-1993	0143Z	243
7056.0	G3NLY	31-Oct-1993	0139Z	169
7029.0	OE6CLD	31-Oct-1993	0138Z	189
7038.0	VP2EC	31-Oct-1993	0131Z	252
7030.0	ZS6EZ	31-Oct-1993	0123Z	211
7037.1	FJ5AB	31-Oct-1993	0122Z	212
7032.0	VP2VFP	31-Oct-1993	0118Z	176
7099.9	SP6YAQ	31-Oct-1993	0113Z	205
7060.0	LZ9A	31-Oct-1993	0111Z	190
7052.0	OT3T	31-Oct-1993	0109Z	273
7058.1	PJ1B	31-Oct-1993	0108Z	218
7063.0	PI4TUE	31-Oct-1993	0107Z	239
7029.1	OE6CLD	31-Oct-1993	0100Z	188
7058.6	4U1VIC	31-Oct-1993	0054Z	264
7087.1	CN2JR	31-Oct-1993	0047Z	285
7045.9	EA9UK	31-Oct-1993	0042Z	202
7099.0	4U1ITU	31-Oct-1993	0031Z	219
7099.7	SP6YAQ	31-Oct-1993	0023Z	188
7032.0	VP5VFP	31-Oct-1993	0019Z	174
7038.9	HG6Y	31-Oct-1993	0021Z	215
7072.8	G3NLY	31-Oct-1993	0015Z	170
7033.9	9K2ZZ	31-Oct-1993	0011Z	175
7064.7	S59UN	31-Oct-1993	0013Z	239
7027.0	ZS6EZ	31-Oct-1993	0000Z	273
7091.2	IV3YYK	31-Oct-1993	0002Z	265
7099.0	4U1ITU	30-Oct-1993	2355Z	219
7054.0	TI1C	30-Oct-1993	2359Z	208
7054.0	TI1C	30-Oct-1993	2355Z	199
7040.0	PJ9U	30-Oct-1993	2351Z	260
7065.4	R6L	30-Oct-1993	2350Z	200
7040.0	PJ9U	30-Oct-1993	2349Z	258
7060.0	LZ9A	30-Oct-1993	2346Z	190
7049.4	UR8J	30-Oct-1993	2341Z	258

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7045.2	EA8BR	30-Oct-1993	2341Z	206
7084.0	EA3NY	30-Oct-1993	2334Z	208
7027.0	ZS6EZ	30-Oct-1993	2321Z	164
7075.0	C6AFT	30-Oct-1993	2321Z	254
7054.0	TI1C	30-Oct-1993	2319Z	192
7065.5	R6L	30-Oct-1993	2319Z	203
7083.0	IS0QDV	30-Oct-1993	2316Z	163
7071.8	EA8AH	30-Oct-1993	2315Z	192
7059.9	LZ9A	30-Oct-1993	2312Z	190
7074.5	OK5W	30-Oct-1993	2310Z	230
7060.1	LZ9A	30-Oct-1993	2307Z	190
7057.0	OM3KAG	30-Oct-1993	2306Z	175
7080.6	ZB2X	30-Oct-1993	2302Z	153
7050.8	OT3T	30-Oct-1993	2305Z	270
7081.0	RZ6LJ	30-Oct-1993	2243Z	173
7076.4	ED3DU	30-Oct-1993	2211Z	270
7043.2	EA3CWK	30-Oct-1993	2209Z	270
7088.2	VK3AJJ	30-Oct-1993	1230Z	235
7083.5	N6VI/KH6	30-Oct-1993	1228Z	239
7079.0	VP5L	30-Oct-1993	1227Z	208
7057.8	ZF2JI	30-Oct-1993	1218Z	194
7048.0	VP2EC	30-Oct-1993	1214Z	220
7046.3	CH9DH	30-Oct-1993	1213Z	230
7042.0	PJ9U	30-Oct-1993	1212Z	256
7059.6	YV5MRR	30-Oct-1993	1206Z	266
7052.5	VK9LI	30-Oct-1993	1151Z	205
7088.2	VK3AJJ	30-Oct-1993	1154Z	235
7057.0	ZF2JI	30-Oct-1993	1152Z	190
7048.0	VP2EC	30-Oct-1993	1148Z	249
7082.5	6Y5IC	30-Oct-1993	1143Z	230
7096.3	WR6R/KH6	30-Oct-1993	1117Z	235
7091.4	VK3EW	30-Oct-1993	1116Z	239
7072.2	TI5RLI	30-Oct-1993	1058Z	183
7048.0	VP2EC	30-Oct-1993	1048Z	248
7099.8	OA4ANR	30-Oct-1993	0928Z	159
7052.5	TI1C	30-Oct-1993	0737Z	219
7060.5	TF3CW	30-Oct-1993	0916Z	207
7070.0	VK3EW	30-Oct-1993	0914Z	160
7096.0	JF1CST	30-Oct-1993	0910Z	224
7091.0	G3NLY	30-Oct-1993	0729Z	178
7084.8	ZL4NF	30-Oct-1993	1038Z	187
7090.0	VK2BEX	30-Oct-1993	0907Z	226
7072.5	V26B	30-Oct-1993	0905Z	233
7085.0	VP2VFP	30-Oct-1993	0725Z	174
7045.0	VK1DX	30-Oct-1993	0902Z	186
7091.0	VK9LI	30-Oct-1993	1031Z	209
7091.0	VK9LI	30-Oct-1993	1029Z	209
7089.9	TI1C	30-Oct-1993	0844Z	214
7070.0	VK3EW	30-Oct-1993	0842Z	160
7098.1	YV5MRR	30-Oct-1993	0834Z	260
7096.0	JF1IST	30-Oct-1993	0836Z	220
7079.7	P40W	30-Oct-1993	0831Z	216
7087.0	JM1XCW	30-Oct-1993	1012Z	188
7044.6	PJ1B	30-Oct-1993	0831Z	225
7039.0	9Y4H	30-Oct-1993	0831Z	172
7039.0	9Y4H	30-Oct-1993	0830Z	172
7050.0	V47KP	30-Oct-1993	0826Z	231
7081.8	CN2JR	30-Oct-1993	0807Z	238
7088.1	YV5MRR	30-Oct-1993	0651Z	260
7099.3	OA4ANR	30-Oct-1993	0936Z	159
7041.3	VP2EC	30-Oct-1993	0803Z	232
7029.9	P40L	30-Oct-1993	0758Z	249
7096.9	CS1A	30-Oct-1993	0801Z	180
7072.4	V26B	30-Oct-1993	0957Z	233
7086.5	VK3TZ	30-Oct-1993	0951Z	199
7090.8	G3NLY	30-Oct-1993	0750Z	182
7095.0	WH8/WK6V	30-Oct-1993	0951Z	193
7099.1	VK2BEX	30-Oct-1993	0950Z	226
7098.1	P29DK	30-Oct-1993	0935Z	158
7054.9	T49AB	30-Oct-1993	0923Z	232
7099.8	OA4ANR	30-Oct-1993	0928Z	159
7090.0	VK2BEX	30-Oct-1993	0907Z	226
7203.0	VP5L	30-Oct-1993	0859Z	
7060.5	TF3CW	30-Oct-1993	0916Z	207
7052.5	TI1C	30-Oct-1993	0737Z	219
7045.0	VK1DX	30-Oct-1993	0902Z	186
7070.0	VK3EW	30-Oct-1993	0914Z	160
7096.0	JF1CST	30-Oct-1993	0910Z	224

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7072.5	V26B	30-Oct-1993	0905Z	233
7090.0	VK2BEX	30-Oct-1993	0907Z	226
7203.0	VP5L	30-Oct-1993	0859Z	
7091.0	G3NLY	30-Oct-1993	0729Z	178
7045.0	VK1DX	30-Oct-1993	0902Z	186
7072.5	V26B	30-Oct-1993	0905Z	233
7074.0	C6AFT	30-Oct-1993	0722Z	244
7083.1	PT7CB	30-Oct-1993	0716Z	215
7069.8	VK3EW	30-Oct-1993	0852Z	160
7065.9	VP5L	30-Oct-1993	0851Z	203
7069.6	VP5L	30-Oct-1993	0710Z	188
7078.8	CU2T	30-Oct-1993	0848Z	189
7060.0	LU4FM	30-Oct-1993	0707Z	164
7092.0	NP4Z	30-Oct-1993	0707Z	185
7080.0	KH6/WR6R	30-Oct-1993	0704Z	179
7088.0	YV5MRR	30-Oct-1993	0701Z	260
7049.9	V47KP	30-Oct-1993	0836Z	231
7053.8	PT7CB	30-Oct-1993	0655Z	227
7092.0	NP2Z	30-Oct-1993	0655Z	185
7036.0	V31DX	30-Oct-1993	0830Z	217
7037.0	V31DX	30-Oct-1993	0829Z	217
7093.6	KP2A	30-Oct-1993	0827Z	244
7081.8	CN2JR	30-Oct-1993	0826Z	238
7053.0	XA5T	30-Oct-1993	0817Z	250
7050.1	EA8AH	30-Oct-1993	0824Z	203
7039.1	9Y4H	30-Oct-1993	0823Z	175
7032.6	ZF2JI	30-Oct-1993	0820Z	198
7081.0	KH6/WR6R	30-Oct-1993	0813Z	236
7081.8	CN2JR	30-Oct-1993	0807Z	238
7041.3	VP2EC	30-Oct-1993	0803Z	232
7084.9	VP2VFP	30-Oct-1993	0651Z	174
7088.1	YV5MRR	30-Oct-1993	0651Z	260
7029.9	P40L	30-Oct-1993	0758Z	249
7041.4	VP2EC	30-Oct-1993	0754Z	219
7029.8	P40L	30-Oct-1993	0753Z	224
7054.9	VK9NS	30-Oct-1993	0752Z	180
7096.9	CS1A	30-Oct-1993	0801Z	180
7080.7	WR6R/KH6	30-Oct-1993	0756Z	236
7075.5	P49T	30-Oct-1993	0755Z	193
7085.0	CH3EJ	30-Oct-1993	0748Z	174
7055.2	TF3CW	30-Oct-1993	0745Z	208
7090.1	WH8/WK6V	30-Oct-1993	0728Z	207
7049.1	GW3YDX	30-Oct-1993	0728Z	173
7055.0	VK9NS	30-Oct-1993	0726Z	180
7074.5	C6AFT	30-Oct-1993	0722Z	243
7082.0	CN2JR	30-Oct-1993	0718Z	238
7076.3	VK9LI	30-Oct-1993	0711Z	187
7045.6	V31DX	30-Oct-1993	0710Z	208
7047.8	ZF2JI	30-Oct-1993	0708Z	195
7084.7	VP2VFP	30-Oct-1993	0704Z	174
7034.8	HK0HEU	30-Oct-1993	0705Z	198
7088.3	YV5MRR	30-Oct-1993	0658Z	260
7034.9	HK0HEU	30-Oct-1993	0654Z	198
7054.9	J37K	30-Oct-1993	0643Z	203
7080.0	WR6R/KH6	30-Oct-1993	0634Z	179
7074.5	FY5FY	30-Oct-1993	0634Z	175
7073.0	V7X	30-Oct-1993	0635Z	240
7082.6	HR1K	30-Oct-1993	0631Z	273
7029.0	P40L	30-Oct-1993	0631Z	231
7070.8	HC0E	30-Oct-1993	0627Z	203
7060.1	LU4FM	30-Oct-1993	0626Z	164
7059.2	VP2VFP	30-Oct-1993	0622Z	161
7082.6	8R1K	30-Oct-1993	0619Z	260
7100.0	OH0DX	30-Oct-1993	0617Z	160
7059.3	VP2VFP	30-Oct-1993	0609Z	161
7044.6	PJ1B	30-Oct-1993	0609Z	206
7070.9	HC0E	30-Oct-1993	0608Z	203
7074.6	FY5FY	30-Oct-1993	0607Z	175
7090.9	XQ8ABF	30-Oct-1993	0602Z	187
7093.0	NP4Z	30-Oct-1993	0600Z	193
7082.5	8R1K	30-Oct-1993	0556Z	218
7071.5	6V6U	30-Oct-1993	0551Z	161
7029.2	P40L	30-Oct-1993	0551Z	245
7044.5	PJ1B	30-Oct-1993	0548Z	206
7076.2	IT9VDQ	30-Oct-1993	0544Z	185
7079.8	T49AB	30-Oct-1993	0541Z	215
7086.5	N6VI/KH6	30-Oct-1993	0538Z	164
7053.4	TO5MM	30-Oct-1993	0537Z	218

40 METERS

7047.8	XA5T	30-Oct-1993	0535Z	228
7075.9	HH2PK	30-Oct-1993	0529Z	152
7080.0	EA6ARM	30-Oct-1993	0522Z	185
7055.4	ZB2X	30-Oct-1993	0519Z	188
7078.6	CU2T	30-Oct-1993	0517Z	189
7044.0	EA6CWK	30-Oct-1993	0506Z	244
7095.0	YV5MRR	30-Oct-1993	0319Z	230
7039.9	LZ1RN	30-Oct-1993	0310Z	208
7035.0	ZD8VJ	30-Oct-1993	0505Z	194
7034.9	ZD8VJ	30-Oct-1993	0505Z	194
7061.8	C51A	30-Oct-1993	0503Z	185
7064.6	YT7A	30-Oct-1993	0505Z	249
7060.2	CT7D	30-Oct-1993	0501Z	226
7059.9	CT7D	30-Oct-1993	0504Z	226
7089.2	FY5FY	30-Oct-1993	0457Z	185
7046.2	PJ9U	30-Oct-1993	0501Z	237
7082.0	VP5L	30-Oct-1993	0458Z	224
7046.2	PJ9U	30-Oct-1993	0457Z	237
7043.0	EA9UK	30-Oct-1993	0458Z	184
7099.6	F6AOJ	30-Oct-1993	0314Z	248
7099.0	OE1EFY	30-Oct-1993	0452Z	204
7043.0	EA9UK	30-Oct-1993	0450Z	189
7089.3	FY5FY	30-Oct-1993	0442Z	178
7092.8	SU2MT	30-Oct-1993	0438Z	203
7034.9	ZD8VJ	30-Oct-1993	0430Z	194
7099.6	OH0DX	30-Oct-1993	0431Z	213
7058.5	P49T	30-Oct-1993	0428Z	187
7092.8	IS0QDV	30-Oct-1993	0428Z	178
7099.4	OH0DX	30-Oct-1993	0426Z	213
7098.6	4X/S59PR	30-Oct-1993	0426Z	249
7061.0	4U48UN	30-Oct-1993	0414Z	298
7039.1	CH9DH	30-Oct-1993	0410Z	254
7066.0	XE2DV	30-Oct-1993	0412Z	203
7031.9	ZS6EZ	30-Oct-1993	0404Z	206

SPECIAL NOTE:

- These spots are all of the SSB variety that occurred during the October 1993 CQWWDX Phone Contest.

- On Duplex type contacts the transmit frequency is listed as three digits only.
  On 75 meters, 819 would mean 3.819 khz.
  On 40 meters, 178 would mean 7.178 khz.

- Notice the wide splits on each of these bands. These splits can give you an idea of the density of signals being heard by the DX station.

- Notice the 75 meter splits of station EA8AH - a very busy weekend.

- We rate Sunday as superior to Saturday for low band propagation and 1993 just marginally better than 1992.

LOW BAND MONITOR POWER SPOTS - NOVEMBER 1993

TNX: N8HTT - W8TN - KY0A - KD7SO - W8UVZ - K3ND

160 METERS

1910.0	JA3ONB	18-NOV-1993	1218Z
1909.0	JF1NZW	18-NOV-1993	1211Z
1908.0	JA1HQT	18-NOV-1993	1210Z
1832.0	ZD8Z	18-NOV-1993	0448Z
1840.0	OZ1DPR	18-Nov-1993	0244Z
1835.0	6W6JX	16-Nov-1993	0403Z
1829.0	OY9JD	13-Nov-1993	0524Z
1833.5	KL7RA	13-Nov-1993	0518Z
1830.0	JW5NM	13-Nov-1993	0405Z
1832.0	ZD8Z	13-Nov-1993	0414Z
1832.0	FG5BG	13-Nov-1993	0256Z
1837.0	VP5/AI5P	13-Nov-1993	0251Z
1834.0	KP2J	13-Nov-1993	0044Z
1824.4	FJ/F6HWU	13-Nov-1993	0042Z
1834.0	KG4CB	12-Nov-1993	0305Z
1831.8	KH6CC	10-Nov-1993	1158Z
1834.0	F1MXP	10-Nov-1993	0603Z
1840.0	I3MAU	10-Nov-1993	0502Z
1831.5	FG5IE	10-Nov-1993	0501Z
1832.3	FG5BG	10-Nov-1993	0455Z
1830.1	IK5TH	10-Nov-1993	0449Z
1840.0	FM5DN	10-Nov-1993	0304Z
1832.6	KH6AT	9-Nov-1993	0913Z
1836.8	KG4CB	9-Nov-1993	0327Z
1834.0	EA3JE	8-Nov-1993	2313Z
1850.0	ON4ACG	8-Nov-1993	0530Z
1831.0	**4S0DX**	**6-Nov-1993**	**2232Z**
1825.0	VK3DQW	6-Nov-1993	1134Z
1825.0	VK2DPS	6-Nov-1993	1110Z
1832.9	ZL2JR	6-Nov-1993	0716Z
1833.0	FG5BG	6-Nov-1993	0416Z
1831.9	VP2ET	6-Nov-1993	0200Z
1831.0	FG5BG	5-Nov-1993	2240Z
1832.6	KH6AT	5-Nov-1993	1144Z
1832.9	VP2VA	5-Nov-1993	1007Z
1840.0	IK1MNJ	5-Nov-1993	0617Z
1834.1	PA0LEG	5-Nov-1993	0553Z
1840.0	HR2BDC	5-Nov-1993	0546Z
1840.0	IV3PRK	5-Nov-1993	0539Z
1831.0	PA0LEG	5-Nov-1993	0526Z
1839.4	JY4MB	5-Nov-1993	0523Z
1833.5	OK1DOT	5-Nov-1993	0507Z
1830.2	IV3PRK	5-Nov-1993	0503Z
1832.3	DK7SU	5-Nov-1993	0436Z
1831.1	YO3APJ	5-Nov-1993	0430Z
1832.4	VP2VA	5-Nov-1993	0356Z
1833.2	FG5BG	5-Nov-1993	0228Z
1831.5	GI0KOW	5-Nov-1993	0135Z
1840.0	HB0/DF0GY	5-Nov-1993	0118Z
1834.0	GI0KOW	5-Nov-1993	0106Z
1829.0	EI5HJ	5-Nov-1993	0033Z
1836.6	G3PQA	5-Nov-1993	0028Z
1834.0	GI0KOW	5-Nov-1993	0008Z
1832.8	KH6AT	4-Nov-1993	1142Z
1838.7	ZL2ADX	4-Nov-1993	0801Z
1831.4	ZL2JR	4-Nov-1993	0755Z
1835.8	ZL2ADX	4-Nov-1993	0729Z
1833.5	VK9NS	4-Nov-1993	0724Z
1839.1	HR2BDC	4-Nov-1993	0720Z
1831.4	ZL2JR	4-Nov-1993	0711Z
1831.1	ZL2JN	4-Nov-1993	0710Z
1837.7	FK8CP	4-Nov-1993	0706Z
1829.7	EA7AIN	4-Nov-1993	0703Z
1831.5	PA0LEG	4-Nov-1993	0632Z
1831.6	G3PQA	4-Nov-1993	0623Z
1828.8	F6CXJ	4-Nov-1993	0620Z
1845.0	HB9ADQ	4-Nov-1993	0608Z
1840.0	EA8PP	4-Nov-1993	0519Z
1838.0	C51A	4-Nov-1993	0344Z
1827.8	4K2MAL	3-Nov-1993	0253Z
1831.6	JW5NM	3-Nov-1993	0233Z
1843.0	4U1ITU	3-Nov-1993	0233Z
1831.2	4K2MAL	3-Nov-1993	0009Z
1833.8	SM3PZG	2-Nov-1993	2333Z
1833.0	YL2PQ	2-Nov-1993	2323Z
1831.2	4K2MAL	2-Nov-1993	2310Z
1842.0	C51A	2-Nov-1993	0537Z
1847.2	ZB2FK	2-Nov-1993	0054Z

80 METERS

3510.0	HZ1AB	20-Nov-1993	1411Z
3506.0	KC6NH	20-Nov-1993	1334Z
3507.5	ZK1AEB	20-Nov-1993	1233Z
3798.0	ZD8Z	20-Nov-1993	0534Z
3508.0	9V1ZE	19-Nov-1993	1346Z
3504.4	**A35EA**	**19-Nov-1993**	**1142Z**
3505.0	FH/DL5XU	18-Nov-1993	2347Z
3792.8	YS1AG	16-Nov-1993	0345Z
3508.0	FM5CW	16-Nov-1993	0332Z
3791.0	LZ1JY	16-Nov-1993	0327Z
3791.0	A45ZZ	16-Nov-1993	0218Z
3505.0	PZ1DY	16-Nov-1993	0106Z
3793.0	ZD8Z	15-Nov-1993	2126Z
3507.2	LU1DOW	15-Nov-1993	0524Z
3506.0	A25/OH7XM	15-Nov-1993	0336Z
3512.5	HI8/DK7VW	15-Nov-1993	0246Z
3799.5	EA9LZ	14-Nov-1993	0618Z
3505.6	PZ1DY	14-Nov-1993	0541Z
3509.0	3DA0BK	14-Nov-1993	0343Z
3505.0	ZD8VJ	14-Nov-1993	0239Z
3505.8	VS6WV	13-Nov-1993	1432Z
3800.0	GD4PTV	13-Nov-1993	0713Z
3797.5	9K2MU	12-Nov-1993	2214Z
3790.7	EI6S	12-Nov-1993	0127Z
3789.1	ZC4AB	11-Nov-1993	2152Z
3506.8	UA0FZ	11-Nov-1993	1224Z
3513.1	FJ/F6HWU	11-Nov-1993	0056Z
3507.8	6W6/K3IPK	10-Nov-1993	2328Z
3507.3	C21/ZL1AMO	10-Nov-1993	1309Z
3798.7	C53HG	10-Nov-1993	0649Z
3785.0	GD4PTV	10-Nov-1993	0634Z
3800.0	OM3CBU	10-Nov-1993	0558Z
3799.3	Z31PK	10-Nov-1993	0526Z
3509.5	ZS6NW	10-Nov-1993	0349Z
3792.0	GI0KOW	10-Nov-1993	0126Z
3797.0	T94ON	10-Nov-1993	0125Z
3507.9	3DA0BK	9-Nov-1993	0304Z
3510.2	6W6/K3IPK	9-Nov-1993	0304Z
3793.3	KG4CB	9-Nov-1993	0233Z
3794.0	YU1AVQ	9-Nov-1993	0130Z
3508.2	T94US	9-Nov-1993	0112Z
3780.0	UJ8RA	8-Nov-1993	2352Z
3794.3	C31OF	8-Nov-1993	0624Z
3799.5	Z31PK	8-Nov-1993	0500Z
3789.9	4O4D	8-Nov-1993	0137Z
3796.6	5N0MVE	7-Nov-1993	2149Z
3789.5	SV8JE	7-Nov-1993	0538Z
3791.0	HB9FAN	7-Nov-1993	0423Z
3798.6	ZS1RL	7-Nov-1993	0405Z
3505.0	FK8FU	6-Nov-1993	1216Z
3505.0	FK8GJ	6-Nov-1993	1212Z
3795.0	VK6ACY	6-Nov-1993	1156Z
3799.9	TA3D	6-Nov-1993	0444Z
3788.9	V73JT	5-Nov-1993	0750Z
3789.9	ZL2AUA	5-Nov-1993	0636Z
3796.5	C31OF	5-Nov-1993	0611Z
3505.0	ZA/OK2PSZ	5-Nov-1993	0528Z
3511.9	4K1F	5-Nov-1993	0446Z
3789.0	LZ1JY	5-Nov-1993	0341Z
3507.9	3DA0BK	5-Nov-1993	0311Z
3793.0	UJ8JMM	5-Nov-1993	0133Z
3501.0	A71CW	5-Nov-1993	0046Z
3800.0	HB0/DF3GY	5-Nov-1993	0042Z
3797.0	5T5JC	5-Nov-1993	0045Z
3797.0	5B5KC	5-Nov-1993	0037Z
3512.6	HV3SJ	4-Nov-1993	2351Z
3507.2	EV0A	4-Nov-1993	2331Z
3789.2	C53HG	4-Nov-1993	2207Z
3795.3	V73C	4-Nov-1993	1044Z
3505.2	GW3YDX	4-Nov-1993	0739Z
3794.0	C31OF	4-Nov-1993	0640Z
3502.0	4K1F	4-Nov-1993	0640Z
3798.1	CX9AU	4-Nov-1993	0614Z
3502.1	4K1F	4-Nov-1993	0546Z
3793.7	C53HG	4-Nov-1993	0522Z
3502.1	4K1F	4-Nov-1993	0511Z
3508.0	3DA0BK	4-Nov-1993	0317Z
3505.0	SV1AOZ	3-Nov-1993	0456Z

40 METERS

7005.0	ZA1J	16-Nov-1993	0023Z
7002.0	ZD8M	16-Nov-1993	0020Z
7001.0	GM3POI	16-Nov-1993	0002Z
7002.9	T77C	15-Nov-1993	2200Z
7002.0	TA2BD	15-Nov-1993	2115Z
7000.5	IS0OMH	15-Nov-1993	0237Z
7002.7	ZA1OK	15-Nov-1993	0201Z
7006.4	6W6/K3IPK	15-Nov-1993	0027Z
7001.7	A22MN	14-Nov-1993	2131Z
7001.0	T97T	14-Nov-1993	0206Z
7004.3	JW0H	14-Nov-1993	0110Z
7001.8	A25/OH7XM	13-Nov-1993	2258Z
7004.0	BV7FC	12-Nov-1993	1236Z
7005.0	6W6JX	13-Nov-1993	0757Z
7002.0	ZD8VJ	13-Nov-1993	0656Z
7011.0	ZS1AAX	13-Nov-1993	0348Z
7002.0	ZD8Z	13-Nov-1993	0230Z
7001.3	9K2ZZ	13-Nov-1993	0010Z
7006.9	P29DK	12-Nov-1993	1309Z
7011.2	C21/ZL1AMO	12-Nov-1993	1211Z
7004.5	9V1ZE	12-Nov-1993	1218Z
7002.0	CX3EU	12-Nov-1993	0921Z
7004.0	V63UF	12-Nov-1993	0744Z
7007.0	5R8DG	12-Nov-1993	0308Z
7002.0	4Z4DX	12-Nov-1993	0211Z
7003.7	TU2MA	12-Nov-1993	0208Z
7005.8	HZ1AB	12-Nov-1993	0155Z
7012.9	S52WA	12-Nov-1993	0123Z
7007.4	OM3CED	12-Nov-1993	0119Z
7011.8	SV1AKX	12-Nov-1993	0113Z
7004.0	TU2MA	12-Nov-1993	0109Z
7004.5	OX3BV	12-Nov-1993	0104Z
7012.9	6W6/K3IPK	12-Nov-1993	0102Z
7007.0	ZA1J	12-Nov-1993	0029Z
7005.0	V63UF	11-Nov-1993	0724Z
7008.4	4N7DW	11-Nov-1993	0240Z
7002.2	FG5BP	11-Nov-1993	0238Z
7006.0	5Z4FO	11-Nov-1993	0220Z
7004.1	UA0QFC	11-Nov-1993	0214Z
7004.4	UA0RAU	11-Nov-1993	0206Z
7002.8	CE1IDM	11-Nov-1993	0154Z
7011.5	YN/SM0OIG	11-Nov-1993	0114Z
7001.9	ZD8Z	11-Nov-1993	0043Z
7006.0	6W6/K3IPK	11-Nov-1993	0037Z
7003.0	OH0BBF	11-Nov-1993	0002Z
7002.3	4Z4DX	10-Nov-1993	2354Z
7006.1	9V1ZE	10-Nov-1993	2320Z
7009.0	JW0H	10-Nov-1993	1042Z
7008.0	**C21/ZL1AMO**	**10-Nov-1993**	**1028Z**
7003.9	FY5YE	10-Nov-1993	0518Z
7006.0	Z21HS	10-Nov-1993	0448Z
7004.6	S79MX	10-Nov-1993	0247Z
7003.0	5R8DG	10-Nov-1993	0212Z
7004.7	C91J	9-Nov-1993	2239Z
7013.9	V85US	9-Nov-1993	1414Z
7005.0	HS0ZBI	9-Nov-1993	1248Z
7005.1	HS0ZBI	9-Nov-1993	1244Z
7004.3	4K2PGO	8-Nov-1993	2246Z
7034.0	AH3C	8-Nov-1993	0231Z
7005.6	JW0H	6-Nov-1993	2304Z
7002.3	5T5JC	6-Nov-1993	2247Z
7005.1	BV3TA	6-Nov-1993	1409Z
7006.0	ZB2EO	6-Nov-1993	1322Z
7088.1	9V1XQ	6-Nov-1993	1053Z
7019.2	TR8XX	6-Nov-1993	0448Z
7003.2	SV2BBJ	5-Nov-1993	2223Z
7007.2	3D2AG/P	5-Nov-1993	1046Z
7005.1	Z21HS	5-Nov-1993	0436Z
7002.0	7Q7XX	5-Nov-1993	0021Z
7015.2	HK0ER	4-Nov-1993	2341Z
7008.9	RI8AA	4-Nov-1993	1230Z
7009.4	9V1ZE	4-Nov-1993	1219Z
7007.0	HL1AVS	4-Nov-1993	1125Z
7004.2	VS6WV	4-Nov-1993	1019Z
7004.6	FO5BI	4-Nov-1993	0615Z
7005.1	3B8CF	4-Nov-1993	0222Z
7007.6	YO3AC	3-Nov-1993	0218Z
7013.3	9X5HG	3-Nov-1993	0137Z